FLEXIBLE TOOTHBRUSH AND METHOD OF MANUFACTURING THE SAME

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CROSS- REFERENCE TO RELATED APPLICATION

This application depends from and claims priority to U.S. Provisional Patent Application No. 60/414,856, filed September 27, 2002, which is hereby incorporated by reference.

TECHNICAL FIELD

Disclosed embodiments herein relate generally to toothbrushes, and more particularly to a toothbrush particularly designed for children comprising an elastic head and a rigid handle.

BACKGROUND

The positive effect of proper oral hygiene upon the health of teeth and gums is well known. Without proper oral hygiene, the teeth and gums can become a breeding ground for bacteria, specifically, plaque. The accumulation of plaque on the teeth is one of the major causes of tooth decay and gum disease. More importantly, it can destroy the gum tissue and bone that support the teeth, which could eventually require the teeth to be removed. In order to control plaque, dentists recommend brushing the teeth at least twice a day.

To preserve healthy teeth and gums, it is beneficial to remove plaque as it develops. The build-up of plaque can begin soon after teeth initially emerge in the

mouth and can progress quickly. Therefore, it has been shown that good oral hygiene on the part of infants and small children can be helpful in the prevention of tooth decay and maintenance of healthy gums. The development of good brushing habits early is key to good oral hygiene practices that will last throughout a person's life.

Choosing the right toothbrush for infants and young children and developing a regular brushing regimen can be a very difficult task. Prior to the surfacing of teeth, gently rubbing or wiping the infant's gums will help dislodge bacteria in order to maintain the health of the gums. When teeth eventually emerge, brushing the teeth promotes the removal of plaque and other debris that may result in bacterial formations upon the teeth, and eventually tooth decay. Toothbrushes designed for infants or small children are generally identical to commonly used adult toothbrushes, but smaller in size. Such brushes can be difficult for a small child to manipulate and thus be ineffective in dental cleaning. Since infants and small children are typically unable to adequately brush their own teeth and gums, most parents assist with the brushing of the teeth. Unfortunately, infants and small children are often uncooperative, making it very difficult to effectively clean the child's teeth.

Furthermore, when brushing teeth without appropriate skill, excessive force can easily be exerted on both the teeth and the gums, thereby causing pain. Another drawback is the difficulty of cleaning the toothbrush thoroughly, as bacteria or germs can be concealed between bristles themselves, which might not be obvious to young children. Therefore, there is a need to have a toothbrush particularly designed for use by infants and young children that cleans the gums and teeth, is appealing and

concurrently teaches young children how to use a toothbrush properly without causing any pain to their gums or teeth.

BRIEF SUMMARY

Disclosed herein are a toothbrush and method of manufacturing the same. The toothbrush comprises an arced tray comprising a base and sidewalls defining a length of the arced tray. In this embodiment, a first longitudinal edge of each sidewall is perpendicularly coupled to opposing longitudinal edges of the base to define a channel between the sidewalls, the channel adapted to receive teeth therein. The toothbrush further includes flexible flanges perpendicularly coupled to corresponding second longitudinal edges of each of the corresponding sidewalls opposite the corresponding first longitudinal edges. As such, the flanges extend over a portion of the channel, where a first end of the channel has a first width smaller than a second width at a second end of the channel. The toothbrush also includes a handle coupled to a side of the arced tray opposite the channel and extending therefrom. Moreover, in these embodiments, the curvature of the arced tray curves away from the handle.

A method for manufacturing the toothbrush disclosed herein includes providing an arced tray comprising a base and sidewalls defining a length of the arced tray. The method further includes coupling a first longitudinal edge of each sidewall perpendicularly to opposing longitudinal edges of the base to define a channel between the sidewalls, where the channel is adapted to receive teeth therein. The method also includes forming flexible flanges perpendicularly on corresponding second longitudinal edges of each of the sidewalls opposite the corresponding first longitudinal edges. In

this embodiment, the flanges extend over a portion of the channel, where a first end of the channel has a first width smaller than a second width at a second end of the channel. Also included in this embodiment, is coupling a handle to a side of the arced tray opposite the channel, where the handle is extending therefrom. In such an embodiment, the curvature of the arced tray curves away from the handle.

Although the toothbrush described herein can be used by anyone, one embodiment is particularly designed for infants and young children at least 18 months old, and more preferably about 3-6 years old. The arced tray is adapted to the arch of the upper and lower jaw of the teeth and gum, which makes it more comfortable and suitable for young children. The present invention is user-friendly and can be used simply by the movement of the children' jaw and the toothbrush. The movement of the jaw in various directions will increase saliva flow, which can kill bacteria inside the mouth.

Details of one or more embodiments of the toothbrush and methods of manufacturing the same are set forth in the description below. These embodiments are for illustrative purposes only and the principle disclosed herein can be implemented in other embodiments. Other features and advantages will become apparent from the following description.

BRIEF DESCRIPTION OF THE DRAWINGS

It is emphasized that various features or components in the drawings included herein may not be illustrated for clarity of discussion. In addition, it is emphasized that various features may not be drawn to scale. In fact, the dimensions of various features

may be arbitrarily increased or reduced for clarity of discussion. With this in mind, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which:

FIGURE 1a illustrates a perspective view of one embodiment of a toothbrush constructed according to the principles disclosed herein;

FIGURE 1b illustrates another perspective view of the toothbrush illustrated in FIGURE 1a;

FIGURE 2 illustrates a cross-sectional view taken along line 2-2 of the toothbrush shown in FIGURE 1a; and

FIGURE 3 illustrates a cross-sectional view taken along line 3-3 of the toothbrush shown in FIGURE 1b.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

A toothbrush and method of manufacturing the same are disclosed herein. An embodiment of a toothbrush 100 constructed according to the principles disclosed herein is depicted in **FIGURES 1a** and **1b**. According to one embodiment, the toothbrush 100 includes an arced tray 110, which is adapted to cover and clean the teeth when the jaw is moved up and down or left and right when the toothbrush 100 is being used.

The arced tray 110 includes a base 130 and sidewalls 140, which define a length of the arced tray 110. In the illustrated embodiment, one longitudinal edge of each sidewall 140 is perpendicularly attached to opposing longitudinal edges of the base 130 to define a channel between the sidewalls 140 and a face of the base 130, wherein the

channel is adapted to receive teeth therein. According to a particularly advantageous embodiment, the arced tray 110 is comprised of a flexible material. More specifically, the arced tray 110 may be constructed from soft elastic tear-resistant material, such as silicone or the like. It is contemplated that any equivalent material providing beneficial elasticity and tear-resistance for the arced tray 110 may be used. Moreover, the arced tray 110 may be manufactured using molding techniques, such as injection molding. In such embodiments, the sidewalls 140 and the base 130 may be integrally formed. However, in embodiments employing different manufacturing techniques, the base 130 and sidewalls 140 may simply be joined after each is manufactured individually.

In the illustrated embodiment, the curvature of the arced tray 110 is created using an arc having two foci. By employing two foci, the curvature of the arced tray 110 resembles that of a portion of an ellipse. Thus, in such an embodiment, the arc is not uniformly curved, but rather it has a slowly increasing curvature when moving from one end of the arced tray 110 to the other. As a result, the arced tray 110 more easily conforms to the curvature of the teeth and gums in mouth, allowing for better results when cleaning the teeth with the toothbrush 100. Of course, the curvature of the arced tray 110 is not limited to having two foci, and other embodiments may have a greater number of foci or only one focus to generate the curvature.

According to one embodiment, a handle 180 is attached to the arced tray 110, as illustrated in FIGURES 1a and 1b. In an advantageous embodiment, the handle 180 is perpendicularly coupled to one of the sidewalls 140 of the arced tray 110, as illustrated, and extends therefrom. In a more specific embodiment, the curvature of the arced tray

110 is coplanar with the length of the handle 180 and curves away from the handle 180, as shown in FIGURES 1a and 1b. The perpendicular coupling of the handle 180 to the sidewall 140 of the arced tray 100, as well as the described relationship between the curvature of the arced tray 110 and the handle 180, increases ease and comfort of use of the toothbrush 100. In a particularly advantageous embodiment, the arced tray 110 and the handle 180 are connected together by inserting one end of the handle 180 into a neck 190 of the toothbrush 100, which is in turn coupled to the arced tray 110. In one example of such an embodiment, the neck 190 is integrally formed in or with the arced tray 110, and one end of the handle 180 inserted therein. In related embodiments, the handle 180 is made from thermoplastic material or the like, and manufactured using conventional techniques.

Also illustrated in FIGURES 1a and 1b, the width of the channel tapers from one end of the arced tray 110 to the other end of the arced tray 110. Specifically, one end of the channel has a width smaller than the width of the opposing end of the channel. These widths may be seen in greater detail with reference to FIGURES 2 and 3, which are discussed below. In further embodiments, it is contemplated that the channel is wider at the end of the arced tray 110 furthest from the handle 180. In such embodiments, the tapering allows the toothbrush 100 to accommodate the widening of the teeth that occurs when moving from the anterior teeth to the posterior teeth. In one embodiment, one end of the arced tray 110 is wide enough to accommodate the incisors, whereas the opposite end of the arced tray 110 is wider than the first end in order to accommodate the molars. In a related embodiment, the handle 180 is attached to the

arced tray 110 substantially closer to one end of the arced tray 110. More specifically, as illustrated, the handle 180 may be attached to the arced tray 110 closer to the end of the arced tray 110 that is designed to accommodate the incisors (e.g., smaller width) so that the handle 180 can be held substantially in the middle of the opening of the mouth when the toothbrush 100 is in use.

In a particularly advantageous embodiment, flexible flanges 150 are located on corresponding longitudinal edges of each of the sidewalls 140 that are opposite the longitudinal edges that are connected to the base 130. As illustrated, in such embodiments, the flexible flanges 150 extend inwardly over part of the channel defined by the base 130 and sidewalls 140. By extending over the channel, when the arced tray 110 is applied over the teeth, the flexible flanges 150 allow the user to rub and scrape the side surfaces, e.g., the lingual and buccal surfaces, of the teeth to remove plaque and debris therefrom. In related embodiments, the flanges 150 may be flexible enough to conform at least partially into the spaces between the teeth to remove plaque and other debris from these locations.

In another embodiment, portions of the flexible flanges 150 proximate the wider end of the arced tray 110 include corresponding curvatures 170 on the longitudinal edge of the flanges 150 extending towards the channel. In such embodiments, the curvatures 170 are formed so as to substantially conform to corresponding side surfaces of at least one of the teeth, for example, the lingual and buccal surfaces of molars in order to more efficiently scrape plaque therefrom. In related embodiments, the flexible flanges 150 extend the full length of the arced tray 110 without the curvatures 170. In another

embodiments, the flexible flanges 150 extend only a portion of the length of the arced tray 140, for example, starting at the end of the arced tray 110 having the smaller width. Advantageously, the flanges 150 may be integrally manufactured with the sidewalls 140 using, for example, injection molding techniques, however any appropriate technique may also be employed. Alternatively, the flanges 150 may be manufactured separately from the sidewalls 140, and coupled thereto later in the manufacturing process.

In the illustrated embodiment, flexible protuberances 160 extend from the base 130 into the channel, and are adapted to contact the bottom surface of the teeth. According to one embodiment, the flexible protuberances 160 are integrally formed with the base 130. In another embodiment, the flexible protuberances 160 are located proximate to the end of the channel that is widest, and are adapted to contact bottom surfaces of the molars. This allows the user to clean the occlusal surface of the posterior teeth, for example, by moving their jaw left and right and by moving the handle from left to right and back to front. In advantageous embodiments, the flexible protuberances 160 may be formed integrally with the base 130, or even with the entire tray 110, during manufacturing. In such embodiments, the entire tray 110, including the sidewalls 140, the base 130, the flanges 150 (with or without curvatures 170) and the flexible protuberances 160 may all be formed from silicone or other appropriate material, and using a single injection molding die. However, non-integral flexible protuberances 160 may also be in the channel, which may be implanted on the base 130 in the manner of conventional toothbrushes.

As illustrated by the embodiment in FIGURES 1a and 1b, the toothbrush 100 may comprise a first arced tray 110 and a second arced tray 120 having a curvature opposite the curvature of the first arced tray 110. In such an embodiment, wherein the outer faces of the bases 130 of the arced trays 110, 120 are coupled together to form a single arced unit. The coupling of two (2) trays as illustrated in FIGURES 1a and 1b allows the user to clean both the upper and lower teeth at the same time. According to a related embodiment, the handle 180 is positioned between the arced trays 110, 120.

Now turning to **FIGURE 2**, illustrated is a cross-sectional side view along line 2-2 of the toothbrush 100 shown in FIGURE 1. The illustrated embodiment depicts two (2) arced trays 110, 120 connected to form a single arced unit. More specifically, outer faces of the bases 130 of the first and second trays 110, 120 are coupled together, or, alternatively, integrally formed during the manufacturing process, to form a single unit for the head of the toothbrush 100. Moreover, the flexible flanges 150 extending over part of the channel on both the first and second trays 110, 120 may also be seen. As mentioned above, as the teeth are inserted into the channel and the toothbrush 100 moved in the appropriate directions, the flanges 150 may gently scrape against the side surfaces of the teeth to remove plaque and other debris therefrom.

The illustrated embodiment further includes a first width W_1 at one end of the arced trays 110, 120, wherein the first width W_1 is designed to accommodate the incisors. While the embodiment of FIGURE 2 does not illustrate the flexible protuberances 160 shown in FIGURES 1a and 1b, it is contemplated that the flexible protuberances 160 may be formed throughout the channel of the arced trays 110, 120,

including on the end of the arced trays 110, 120 illustrated in FIGURE 2. Also illustrated in FIGURE 2 is the handle 180 coupled to the arced trays 110, 120 in a perpendicular manner. Of course, the handle 180 may be coupled to the arced trays 110, 120 in any beneficial manner.

Looking now at **FIGURE 3**, illustrated is a cross-sectional view along 3-3 of the toothbrush 100 shown in FIGURES 1a and 1b. FIGURE 3 includes a second width W_2 of the arced trays 110, 120 located on the opposite end of the arced tray 110 from the first width W_1 depicted in FIGURE 2. Advantageously, the second width W_2 is wider than the first width W_1 in order to accommodate the increasing widths of teeth when moving from the front teeth to the molars. In such embodiments, the width of the tray 110 may uniformly taper when moving from the first width W_1 to the second width W_2. Alternatively, the change from the first width W_1 to the second, final width W_2 of the tray may be staggered, in an attempt to conform with the staggered changes in widths of teeth when moving from the front to the back of the mount.

Also shown in FIGURE 3 are flexible protuberances 160 extending from the bases 130 of both the first and second arced trays 110, 120. In addition, the flexible flanges 150 extending over part of the channel on the wider ends of both the first and second trays 110, 120 may also be seen. As mentioned above, these portions of the flexible flanges 150 may also include curvatures 170 (see FIGURES 1a and 1b) to conform to the side surfaces of molars that are inserted into the channels of the arced trays 110, 120 to gently scrape against the molars to remove plaque and other debris therefrom.

While various embodiments of a toothbrush, as well as methods of manufacturing the same, have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the invention(s) should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents. Moreover, the above advantages and features are provided in described embodiments, but shall not limit the application of the claims to processes and structures accomplishing any or all of the above advantages.

Additionally, the section headings herein are provided for consistency with the suggestions under 37 CFR 1.77 or otherwise to provide organizational cues. These headings shall not limit or characterize the invention(s) set out in any claims that may issue from this disclosure. Specifically and by way of example, although the headings refer to a "Technical Field," the claims should not be limited by the language chosen under this heading to describe the so-called technical field. Further, a description of a technology in the "Background" is not to be construed as an admission that technology is prior art to any invention(s) in this disclosure. Neither is the "Brief Summary" to be considered as a characterization of the invention(s) set forth in the claims found herein. Furthermore, any reference in this disclosure to "invention" in the singular should not be used to argue that there is only a single point of novelty claimed in this disclosure. Multiple inventions may be set forth according to the limitations of the multiple claims associated with this disclosure, and the claims accordingly define the invention(s), and their equivalents, that are protected thereby. In all instances, the scope of the claims

shall be considered on their own merits in light of the specification, but should not be constrained by the headings set forth herein.